DETAILED ACTION

Election/Restrictions

1. Restriction is required under 35 U.S.C. 121 and 372.

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1.

In accordance with 37 CFR 1.499, applicant is required, in reply to this action, to elect a single invention to which the claims must be restricted.

Group I, claim(s) 1-23, drawn to a method and apparatus for pasting a thin plate to a planar member.

Group II, claim(s) 24-25, drawn to a method and apparatus for pasting together two continuous metal plates.

2. The inventions listed as Groups I-II do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons: both groups of inventions have different special technical features and thus lack unity. The special technical feature of the inventions in Group I are drawn to the use of an adhesive (wax) that is poured between a thin plate and a planar member while a positioning system moves the thin plate/ planar member in the X,Y,Z, and theta directions in order to have a precise fit of the two sheets. On the other hand, the special technical feature drawn to the inventions in group II deal with sheet bodies that are continuously laminated on one another. Furthermore, the positioning system used in group II does not move in all directions and operates based solely on a predetermined thickness of the sheets. The process of pasting to sheets together using a wax is well known in the art. (See for example Kosaki et al. (USP No. 5,800,667 figures 7a and 7b disclosing prior art pasting methods.) Accordingly, both inventions do not have a same or corresponding "special technical feature.

3. During a telephone conversation with David Hill on December 12, 2008 a provisional election was made without traverse to prosecute the invention of Group I, claims 1-23. Affirmation of this election must be made by applicant in replying to this

Office action. Claim24-25 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

4. Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

Claim Objections

1. Claims 6-14 and 20-23 are objected to under 37 CFR 1.75(c) as being in improper form because a multiple dependent claim cannot depend on another multiple dependant claim. See MPEP § 608.01(n). Accordingly, the claims 6-14 and 20-23 have not been further treated on the merits.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 1-2, 15-17 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. **(The claim limitation "liquid crystal wax" is indefinite. It is unclear if applicant is claiming a liquid crystal composition that is used as an adhesive or a wax with liquid crystal qualities, or a crystal wax that is**

used as a liquid. This is unclear because liquid crystals are generally not thought of as a wax.)

4. Claims 1-5 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. **(The claim limitation "high flatness" is indefinite. It is unclear from applicant's disclosure how the planar member and the thin plate are held in "high flatness.")**

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

7. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein

were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

8. Claims 1-5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kosaki et al. (USP No. 5,800,667) in view of Yamauchi et al. (US Pre-grant Publication 2003/0179353—made of record by the applicant) in further view of Chang et al. (USP No. 5,976,331).

9. Regarding claim 1, Kosaki teaches a pasting method of pasting a thin plate to a planar member **(a method for adhering a wafer to a support substrate with improved adhesion accuracy—see column 2 lines 15-17)**, said pasting method comprising the steps of: pouring **(Filling)** a wax **(Kosaki teaches that typically a pasting/lamination apparatus will use a wax that is softened as the adhesive to adhere the wafer to a substrate. (See column 1 lines 59-65))** onto the thin plate when the thin plate is disposed below the planar member or onto the planar member when the planar member is disposed below the thin plate **(A gap between the wafer and the support substrate is filled with an adhesive. Such an adhesive is typically a wax. See column 1 line 15 and column 2 lines 41-44)**; heating the wax to keep the wax in a liquid phase **(See figures 2a and 2b and column 6 lines 7-25 disclosing the use of heaters (part numbers 20 and 21) to heat up and soften the wax. It is well known in the art to use a liquid wax as bonding agent so that the wax can be**

deformed easily when pressure is applied to the system.); spreading the wax in a wax layer over the surfaces of the thin plate and the planar member by holding the wax layer between the thin plate and the planar member and moving the thin plate and the planar member relative to each other **(See figures 1(a)-1(b) and column 4 lines 54-57-- disclosing the use of a pressure plate (part # 57) to push the support substrate an the wafer together and thus spread the wax)**; adjusting the thickness of the wax layer to a predetermined thickness **(See figures 1(a)-1(b) and column 4 line 67 to column 5 line 6-- disclosing that gauge blocks (part # 8) are used to calibrate the thickness of the gap between the support substrate and the wafer. Also see column 6 lines 26- 33-- disclosing that the thickness of the wax is determined by the gap between the gauge blocks and the wafer.)**; and cooling the liquid-phase liquid crystal wax layer to solidify the liquid crystal wax layer. **(It is well known in the art that the wax is cooled after compression of the substrate and the wafer. See column 7 lines 34-41 disclosing that the wax is rapidly cooled. Also see for example, (USP No. 3,475,867 by Walsh) which discloses that the wafer/substrate is cooled and the wax is solidified as a last in final step of a mounting method for pasting a wafer on a substrate.)**

10. With respect to claim 1, Kosaki does not explicitly teach wherein: (1) holding the thin plate and the planar member vertically opposite to each other with their joining surfaces extended in high flatness respectively on first and second holding members capable of moving in directions along an X-axis, a Y-axis and a Z-axis and of turning in a θ direction relative to each other and (2) wherein the wax is a liquid crystal wax.

a. However, Yamauchi discloses wherein: (1) holding the thin plate and the planar member vertically opposite to each other with their joining surfaces extended in high flatness respectively on first and second holding members capable of moving in directions along an X-axis, a Y-axis and a Z-axis and of turning in a θ direction relative to each other **(See paragraph [0007 and 0029] disclosing a movable table that has movable support means for holding the object to be positioned and moving the object in multiple positions. See paragraph [0006] and [0026] disclosing that the movable table can move in X,Y,Z and Theta positions. See figure 1 showing that the movable table can go in all directions (X, Y, Z, and Theta))**.

b. Furthermore, the combination of Kosaki and Yamauchi does not teach (2) wherein the wax is a liquid crystal wax.

c. As applied to claim 1, Chang does not explicitly teach (2) wherein the wax is a liquid crystal wax. However, Chang does teach the use of a crystal wax as the adhesive between a wafer and a substrate. **(See column 4 lines 40-43 disclosing mounting a wafer on top of a disk (thin plate) by applying a crystal wax as the adhesive layer. It would have been obvious to one having the ordinary skill in the art to apply the crystal wax in liquid form in order to facilitate a better bond by spreading the wax when the wafer and disk are compressed.)**

d. Kosaki, Yamauchi, and Chang are analogous art because they are from the same field of endeavor which is bonding or pasting a wafer to a substrate or

the like. At the time of the invention, it would have been obvious to the applicant being one of ordinary skill in the art, having the teachings of Kosaki, Yamauchi, and Chang before him or her, to modify the teachings of Kosaki to include the teachings of Yamauchi and Chang for the benefit of increasing bonding accuracy and ensuring uniform wax thickness throughout the bonded wafer/substrate. The motivation for doing so would have been to eliminate post processing of the wafer. As seen in Kosaki (Column 2 lines 4-10), a wafer is typically polished in order to ensure inform thickness of the end product. Therefore, it would have been obvious to combine Kosaki, Yamauchi, and Chang because one would have been motivated to solve the problem of uneven processing of a wafer.

11. Regarding claim 2, Kosaki teaches a pasting method of pasting a thin plate to a planar member **(a method for adhering a wafer to a support substrate with improved adhesion accuracy—see column 2 lines 15-17)**, said pasting method comprising the steps of: pouring **(Filling)** a wax **(Kosaki teaches that typically a pasting/lamination apparatus will use a wax that is softened as the adhesive to adhere the wafer to a substrate. (See column 1 lines 59-65))** onto the thin plate when the thin plate is disposed below the planar member or onto the planar member when the planar member is disposed below the thin plate **(A gap between the wafer and the support substrate is filled with an adhesive. Such an adhesive is typically a wax. See column 1 line 15 and column 2 lines 41-44)**; heating the wax to keep the wax in a liquid phase **(See figures 2a and 2b and column 6 lines 7-25 disclosing the use of heaters (part numbers 20 and 21) to heat up and soften the wax. It is well**

known in the art to use a liquid wax as bonding agent so that the wax can be deformed easily when pressure is applied to the system.); spreading the wax in a wax layer over the surfaces of the thin plate and the planar member by holding the wax layer between the thin plate and the planar member and moving the thin plate and the planar member relative to each other **(See figures 1(a)-1(b) and column 4 lines 54-57-- disclosing the use of a pressure plate (part # 57) to push the support substrate an the wafer together and thus spread the wax)**; adjusting the thickness of the wax layer to a predetermined thickness **(See figures 1(a)-1(b) and column 4 line 67 to column 5 line 6-- disclosing that gauge blocks (part # 8) are used to calibrate the thickness of the gap between the support substrate and the wafer. Also see column 6 lines 26- 33-- disclosing that the thickness of the wax is determined by the gap between the gauge blocks and the wafer.)**; and cooling the wax layer to solidify the wax layer. **(It is well known in the art that the wax is cooled after compression of the substrate and the wafer. See column 7 lines 34-41 disclosing that the wax is rapidly cooled. Also see for example, (USP No. 3,475,867 by Walsh) which discloses that the wafer/substrate is cooled and the wax is solidified as a last in final step of a mounting method for pasting a wafer on a substrate.)**

12. With respect to claim 2, Kosaki does not explicitly teach wherein: (1) holding the thin plate and the planar member vertically opposite to each other with their joining surfaces extended in high flatness respectively on first and second holding members capable of moving in directions along an X-axis, a Y-axis and a Z-axis and of turning in

a θ direction relative to each other and (2) aligning the thin plate and the planar member with each other on the basis of respective recognized positions of the thin plate and the planar member; and (3) wherein the wax is a liquid crystal wax.

e. However, Yamauchi discloses wherein: (1) holding the thin plate and the planar member vertically opposite to each other with their joining surfaces extended in high flatness respectively on first and second holding members capable of moving in directions along an X-axis, a Y-axis and a Z-axis and of turning in a θ direction relative to each other **(See paragraph [0007 and 0029] disclosing a movable table that has movable support means for holding the object to be positioned and moving the object in multiple positions. See paragraph [0006] and [0026] disclosing that the movable table can move in X,Y,Z and Theta positions. See figure 1 showing that the movable table can go in all directions (X, Y, Z, and Theta))** and (2) aligning the thin plate and the planar member with each other on the basis of respective recognized positions of the thin plate and the planar member. **(See abstract and paragraph [0007 and 0011]—disclosing an alignment device used to align the substrate and wafer to each other on the basis of recognized positions of the substrate and wafer.)**

f. Furthermore, the combination of Kosaki and Yamauchi does not teach (3) wherein the wax is a liquid crystal wax.

g. As applied to claim 2, Chang does not explicitly teach (3) wherein the wax is a liquid crystal wax. However, Chang does teach the use of a crystal wax as

the adhesive between a wafer and a substrate. **(See column 4 lines 40-43 disclosing mounting a wafer on top of a disk (thin plate) by applying a crystal wax as the adhesive layer. It would have been obvious to one having the ordinary skill in the art to apply the crystal wax in liquid form in order to facilitate a better bond by spreading the wax when the wafer and disk are compressed.)**

h. Kosaki, Yamauchi, and Chang are analogous art because they are from the same field of endeavor which is bonding or pasting a wafer to a substrate or the like. At the time of the invention, it would have been obvious to the applicant being one of ordinary skill in the art, having the teachings of Kosaki, Yamauchi, and Chang before him or her, to modify the teachings of Kosaki to include the teachings of Yamauchi and Chang for the benefit of increasing bonding accuracy and ensuring uniform wax thickness throughout the bonded wafer/substrate. The motivation for doing so would have been to eliminate post processing of the wafer. As seen in Kosaki (Column 2 lines 4-10), a wafer is typically polished in order to ensure inform thickness of the end product. Therefore, it would have been obvious to combine Kosaki, Yamauchi, and Chang because one would have been motivated to solve the problem of uneven processing of a wafer.

13. Regarding claim 3, Kosaki does not teach wherein the step of aligning the thin plate and the planar member with each other adjusts the positional relation between the thin plate and the planar member in a plane and parallelism between the thin plate and the planar member.

i. However, Yamauchi teaches wherein the step of aligning the thin plate and the planar member with each other adjusts the positional relation between the thin plate and the planar member in a plane and parallelism between the thin plate and the planar member. **(See paragraph [0036] disclosing that the support poles and chuck device moves the wafers in relative parallelism.)**

14. Regarding claim 4, Kosaki does not teach wherein parallelism between the thin plate and the planar member is adjusted by using piezoelectric elements.

j. However, Yamauchi teaches wherein parallelism between the thin plate and the planar member is adjusted by using piezoelectric elements. **(See paragraph [0026].)**

15. Regarding claim 5, Kosaki does not teach wherein the step of aligning the thin plate and the planar member with each other forms respective images of the thin plate held by the first holding member and the planar member held by the second holding member, recognizes the respective positions of the thin plate and the planar member on the basis of the images, and aligns the thin plate and the planar member with each other on the basis of information about the recognized positions of the thin plate and the planar member.

k. However, Yamauchi teaches wherein the step of aligning the thin plate and the planar member with each other forms respective images of the thin plate held by the first holding member and the planar member held by the second holding member, recognizes the respective positions of the thin plate and the planar member on the basis of the images, and aligns the thin plate and the

planar member with each other on the basis of information about the recognized positions of the thin plate and the planar member. **(See paragraph [0029] disclosing the use of an infra-red camera that works in conjunction with the recognition means and the movable table to align the wafers. See paragraph [0030] disclosing that the infra-red camera reads recognition marks for alignment of the wafers.))**

16. Claims 15-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yamauchi et al. (US Pre-grant Publication 2003/0179353—made of record by the applicant) in view of Kosaki et al. (USP No. 5,800,667) in further view of Chang et al. (USP No. 5,976,331).

17. Regarding claim 15, Yamauchi teaches a pasting apparatus for pasting a thin plate to a planar member, said pasting apparatus

I. comprising:

i. First and second holding members respectively for holding the thin plate and the planar member opposite to each other so that respective joining surfaces of the thin plate and the planar member face each other; **(See paragraph [0029] and figure 1 disclosing that wafers (2a) and (2b) are held in place by a movable table (16) and an electrostatic chuck (7).)**

ii. first and second holding mechanisms respectively for operating the first and the second holding member to hold the thin plate and the planar member flat respectively on the first and the second holding member;

(See paragraph [0029] and figure 1 disclosing that wafers (2a) and (2b) are held in place by a movable table (16) and an electrostatic chuck (7). A movable support means (17) helps move the movable table in multiple positions. While a vertical movement mechanism (11) moves the electrostatic chuck.)

iii. a moving mechanism for moving the first and the second holding member relative to each other in directions along an X-axis, a Y-axis and a Z-axis and turning the same in a .theta.-direction; **(See paragraph [0007 and 0029] disclosing a movable table that has movable support means for holding the object to be positioned and moving the object in multiple positions. See paragraph [0006] and [0026] disclosing that the movable table can move in X,Y,Z and Theta positions. See figure 1 showing that the movable table can go in all directions (X, Y, Z, and Theta))**.

iv. a control mechanism for spreading the wax liquefied by the heating means in a wax layer over the joining surfaces of the thin plate and the planar member by holding wax layer between the thin plate and the planar member and moving the thin plate and the planar member relative to each other. **(See abstract and paragraph [0007] disclosing a control means for controlling the drive of the movable support means based on information from the recognition means. Furthermore, it is well known in the art to apply an adhesive to facilitate bonding between**

the wafer and the substrate. (As seen in Kosaki). Therefore, it would have been obvious for one having the ordinary skill in the art to include a mechanism that supplies an adhesive between the wafers.)

m. With respect to claim 15, Yamauchi does not explicitly teach

v. a wax pouring mechanism for pouring a wax onto the thin plate when the thin plate is disposed below the planar member or onto the planar member when the planar member is disposed below the thin plate;

vi. heating means incorporated into at least either of the first and the second holding member;

vii. cooling means incorporated into at least either of the first and the second holding member; and

viii. wherein the wax is a liquid crystal wax

n. However, Kosaki teaches

ix. a wax pouring mechanism for pouring a wax **(Kosaki teaches that typically a pasting/lamination apparatus will use a wax that is softened as the adhesive to adhere the wafer to a substrate. (See column 1 lines 59-65))** onto the thin plate when the thin plate is disposed below the planar member or onto the planar member when the planar member is disposed below the thin plate; **(It is well known in the art to use a liquid wax as bonding agent so that the wax can be deformed easily when pressure is applied to the system. Kosaki discloses that the wax is placed between a substrate and wafer (See column 1 lines**

43-47). Therefore, it would have been obvious to one having the ordinary skill in the art to include a wax pouring mechanism in order to automate the wax addition process.)

x. heating means incorporated into at least either of the first and the second holding member; **(See figures 2a and 2b and column 6 lines 7-25 disclosing the use of heaters (part numbers 20 and 21) to heat up and soften the wax. It is well known in the art to use a liquid wax as bonding agent so that the wax can be deformed easily when pressure is applied to the system.)**

xi. cooling means incorporated into at least either of the first and the second holding member; **(It is well known in the art that the wax is cooled after compression of the substrate and the wafer. See column 7 lines 34-41 disclosing that the wax is rapidly cooled. Also see for example, (USP No. 3,475,867 by Walsh) which discloses that the wafer/substrate is cooled and the wax is solidified as a last in final step of a mounting method for pasting a wafer on a substrate.)**

o. Furthermore, the combination of Kosaki and Yamauchi does not teach wherein the wax is a liquid crystal wax.

p. As applied to claim 15, Chang does not explicitly teach wherein the wax is a liquid crystal wax. However, Chang does teach the use of a crystal wax as the adhesive between a wafer and a substrate. **(See column 4 lines 40-43 disclosing mounting a wafer on top of a disk (thin plate) by applying a**

crystal wax as the adhesive layer. It would have been obvious to one having the ordinary skill in the art to apply the crystal wax in liquid form in order to facilitate a better bond by spreading the wax when the wafer and disk are compressed.)

q. Kosaki, Yamauchi, and Chang are analogous art because they are from the same field of endeavor which is bonding or pasting a wafer to a substrate or the like. At the time of the invention, it would have been obvious to the applicant being one of ordinary skill in the art, having the teachings of Kosaki, Yamauchi, and Chang before him or her, to modify the teachings of Yamauchi to include the teachings of Kosaki and Chang for the benefit of increasing bonding accuracy and ensuring uniform wax thickness throughout the bonded wafer/substrate. The motivation for doing so would have been to eliminate post processing of the wafer. As seen in Kosaki (Column 2 lines 4-10), a wafer is typically polished in order to ensure inform thickness of the end product. Therefore, it would have been obvious to combine Kosaki, Yamauchi, and Chang because one would have been motivated to solve the problem of uneven processing of a wafer.

18. Regarding claim 16, Yamauchi does not explicitly teach wherein the thickness of the liquid crystal wax layer is adjusted through the adjustment of the thickness of the space between the thin plate and the planar member by moving the first and the second holding member relative to each other by the moving mechanism.

r. However, Kosaki teaches wherein the thickness of the wax layer is adjusted through the adjustment of the thickness of the space between the thin

plate and the planar member by moving the first and the second holding member relative to each other by the moving mechanism. **(See figures 1(a)-1(b) and column 4 line 67 to column 5 line 6-- disclosing that gauge blocks (part # 8) are used to calibrate the thickness of the gap between the support substrate and the wafer. Also see column 6 lines 26- 33-- disclosing that the thickness of the wax is determined by the gap between the gauge blocks and the wafer.)**

s. Furthermore, the combination of Kosaki and Yamauchi does not teach wherein the wax is a liquid crystal wax.

t. As applied to claim 16, Chang does not explicitly teach wherein the wax is a liquid crystal wax. However, Chang does teach the use of a crystal wax as the adhesive between a wafer and a substrate. **(See column 4 lines 40-43 disclosing mounting a wafer on top of a disk (thin plate) by applying a crystal wax as the adhesive layer. It would have been obvious to one having the ordinary skill in the art to apply the crystal wax in liquid form in order to facilitate a better bond by spreading the wax when the wafer and disk are compressed.)**

19. Regarding claim 17, Yamauchi teaches a pasting apparatus for pasting a thin plate to a planar member, said pasting apparatus

u. comprising:

xii. first and second holding members respectively for holding the thin plate and the planar member opposite to each other with the respective

joining surfaces of thereof facing each other; **(See paragraph [0029] and figure 1 disclosing that wafers (2a) and (2b) are held in place by a movable table (16) and an electrostatic chuck (7).)**

xiii. first and second holding mechanisms respectively for making the first and the second holding member hold the thin plate and the planar member flat, respectively; **(See paragraph [0029] and figure 1 disclosing that wafers (2a) and (2b) are held in place by a movable table (16) and an electrostatic chuck (7). A movable support means (17) helps move the movable table in multiple positions. While a vertical movement mechanism (11) moves the electrostatic chuck.)**

xiv. a moving mechanism for moving the first and the second holding member relative to each other in directions along an X-axis, a Y-axis, a Z-axis and turning the same in a .theta.-direction; **(See paragraph [0007 and 0029] disclosing a movable table that has movable support means for holding the object to be positioned and moving the object in multiple positions. See paragraph [0006] and [0026] disclosing that the movable table can move in X,Y,Z and Theta positions. See figure 1 showing that the movable table can go in all directions (X, Y, Z, and Theta))**.

xv. a position recognizing mechanism for recognizing the respective positions of the thin plate and the planar member; **(See abstract and paragraph [0007 and 0011]—disclosing an alignment device used to**

align the substrate and wafer to each other on the basis of recognized positions of the substrate and wafer.)

xvi. a parallelism adjusting mechanism for adjusting parallelism between the thin plate and the planar member; **(See paragraph [0036] disclosing that the support poles and chuck device moves the wafers in relative parallelism.)**

xvii. and a control means for controlling the parallelism adjusting mechanism and the moving mechanism; **(See abstract disclosing that there is a control means for controlling the drive of the movable support means which move by way of piezoelectric actuators to align.)**

xviii. wherein the control means controls the parallelism adjusting mechanism and the moving mechanism on the basis of information provided by the position recognizing mechanism to position the thin plate and the planar member in a predetermined positional relation, and controls the moving mechanism in a state where the wax is held between the thin plate and the planar member to move the thin plate and the planar member relative to each other to spread the wax in a wax layer over the surfaces of the thin plate and the planar member. **(See paragraph [0034] disclosing that the alignment device adjusts based on information that is based on position recognition information and derived from an infrared camera. Although not expressly shown in Yamauchi, the**

wax would be spread around by the positional movement of the alignment device. It would have been obvious to one having the ordinary skill in the art to adapt the positional control to control the wax distribution as this is a well known concern in conventional pasting methods for pasting a wafer on a substrate. Spreading the wax evenly will eliminate the need for post process polishing, which is typically done to ensure that the wafer is uniform in thickness.)

v. With respect to claim 17, Yamauchi does not teach

xix. a liquid crystal wax pouring mechanism for pouring a liquid crystal wax onto the thin plate when the thin plate is disposed below the planar member or onto the planar member when the planar member is disposed below the thin plate;

xx. heating means incorporated into at least either of the first and the second holding member;

xxi. cooling means incorporated into at least either of the first and the second holding member; cooling means incorporated into at least either of the first and the second holding member;

xxii. Wherein the wax is a liquid crystal wax.

w. However, Kosaki teaches

xxiii. a wax pouring mechanism for pouring a wax onto the thin plate when the thin plate is disposed below the planar member or onto the planar member when the planar member is disposed below the thin plate;

(It is well known in the art to use a liquid wax as bonding agent so that the wax can be deformed easily when pressure is applied to the system. Kosaki discloses that the wax is placed between a substrate and wafer (See column 1 lines 43-47). Therefore, it would have been obvious to one having the ordinary skill in the art to include a wax pouring mechanism in order to automate the wax addition process.)

xxiv. heating means incorporated into at least either of the first and the second holding member; **(See figures 2a and 2b and column 6 lines 7-25 disclosing the use of heaters (part numbers 20 and 21) to heat up and soften the wax. It is well known in the art to use a liquid wax as bonding agent so that the wax can be deformed easily when pressure is applied to the system.)**

xxv. cooling means incorporated into at least either of the first and the second holding member; cooling means incorporated into at least either of the first and the second holding member; **(It is well known in the art that the wax is cooled after compression of the substrate and the wafer. See column 7 lines 34-41 disclosing that the wax is rapidly cooled. Also see for example, (USP No. 3,475,867 by Walsh) which discloses that the wafer/substrate is cooled and the wax is solidified as a last in final step of a mounting method for pasting a wafer on a substrate.)**

x. Furthermore, the combination of Kosaki and Yamauchi does not teach wherein the wax is a liquid crystal wax.

y. As applied to claim 17, Chang does not explicitly teach (2) wherein the wax is a liquid crystal wax. However, Chang does teach the use of a crystal wax as the adhesive between a wafer and a substrate. **(See column 4 lines 40-43 disclosing mounting a wafer on top of a disk (thin plate) by applying a crystal wax as the adhesive layer. It would have been obvious to one having the ordinary skill in the art to apply the crystal wax in liquid form in order to facilitate a better bond by spreading the wax when the wafer and disk are compressed.)**

z. Kosaki, Yamauchi, and Chang are analogous art because they are from the same field of endeavor which is bonding or pasting a wafer to a substrate or the like. At the time of the invention, it would have been obvious to the applicant being one of ordinary skill in the art, having the teachings of Kosaki, Yamauchi, and Chang before him or her, to modify the teachings of Yamauchi to include the teachings of Kosaki and Chang for the benefit of increasing bonding accuracy and ensuring uniform wax thickness throughout the bonded wafer/substrate. The motivation for doing so would have been to eliminate post processing of the wafer. As seen in Kosaki (Column 2 lines 4-10), a wafer is typically polished in order to ensure inform thickness of the end product. Therefore, it would have been obvious to combine Kosaki, Yamauchi, and Chang because one would have been motivated to solve the problem of uneven processing of a wafer.

20. Regarding claim 18, Yamauchi teaches wherein the control means controls an operation of the moving mechanism for moving the thin plate and the planar member relative to each other in a direction along the Z-axis to adjust the thickness of the space between the thin plate and the planar member. **(See paragraphs [0031-0032] disclosing that there is a moving mechanism (piezoelectric elements connected to support blocks) for moving the alignment device in a Z direction. See [paragraph [0034] disclosing a control means (micro computer which moves the movable support elements based on input information from infrared cameras>)**

21. Regarding claim 19, Yamauchi teaches wherein the parallelism adjusting mechanism includes piezoelectric elements. **(See paragraph [0026].)**

Conclusion

22. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The reference Tsutsumi et al. (USP No. 5,254,205) which discloses a wafer binding method and apparatus. The reference Barkley (USP No. 4,682,766) which discloses an X-Y-Z positioning system for making printed circuit boards. The reference Brady et al. (USP No. 3,870,416) which discloses a wafer alignment apparatus. The reference Walsh (USP No. 3,475,867) which discloses a device for applying wax between a substrate and semiconductor.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to AMJAD ABRAHAM whose telephone number is

(571)270-7058. The examiner can normally be reached on Monday through Friday 8:00 AM to 5:00 PM Eastern Time.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Phillip Tucker can be reached on (571) 272-1095. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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AAA

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